MAI-2005-24

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
Metal and Nonmetal Mine Safety and Health

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Limestone)

Fatal Powered Haulage Accident
September 13, 2005

Newgate Development Corporation
West Pittsburg Quarry
West Pittsburg, Lawrence County, Pennsylvania
Mine I. D. No. 36-03441

Investigators

William C. Jensen
Mine Safety and Health Inspector

Thomas J. Shilling
Mine Safety and Health Inspector

F. Terry Marshall
Mechanical Engineer

Darren J. Blank
Civil Engineer

Gary R. Cooper
Civil Engineer

James A. Young
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Northeast District
547 Keystone Drive, Suite 400
Warrendale, Pennsylvania 15086-7573
James R. Petrie, District Manager

OVERVIEW

On September 13, 2005, David A. Rogers, truck driver, age 64, was fatally injured when the 50-ton haul truck he was operating overturned. Rogers was preparing to dump a load of rock over the edge of the 21-foot high truck dump site when a portion of the dump site failed. The collapse caused the truck to overturn and land on its roof.

The accident occurred because policies, standards, and controls were not in place to ensure that a berm or similar impeding device was maintained at the dump site. Management failed to visually inspect the dump location to identify signs of possible unstable ground conditions before directing trucks to dump. The victim was not wearing a seat belt which contributed to the severity of his injuries.

GENERAL INFORMATION

West Pittsburg Quarry, a surface limestone operation, owned and operated by Newgate Development Corporation (Newgate) was located along Route 168, West Pittsburg, Lawrence County, Pennsylvania. The principal operating official was John C. Thompson, superintendent. The mine normally operated two 10-hour shifts, 5 days a week. Total employment was 10 persons.

Limestone was drilled and blasted from a single bench in the pit. The broken limestone was loaded into haul trucks by an excavator and transported to a raw material stockpile. The material was then processed through the plant where it was crushed, screened, and stockpiled. The finished products were sold for use in the construction industry.

The last regular inspection at this operation was completed on August 23, 2005.

DESCRIPTION OF ACCIDENT

On the day of the accident, David A. Rogers (victim) reported for work at his normal starting time of 6:00 a.m. Rogers and Rodney E. Thompson, truck drivers, were assigned to haul shot rock from the quarry to the truck dump site.

At approximately 6:30 a.m., Thompson hauled and dumped the first load of shot rock at an area of the dump site that was bermed. Rogers followed with the second load and the two drivers alternated dumping in this area. When Rogers hauled his third load to the dump site, he backed his truck to the northwest side where the berm had been loaded out by the evening shift. The edge of the dump site failed, causing the truck to overturn.

Peter Jaskola, front-end-loader operator, was sent to the primary stockpile to check conditions at the top of the dump site. While driving past the bottom of the pile, he noticed the overturned truck and began blowing the loader's horn to summon help. When Jaskola approached the truck and opened the cab door, he found Rogers lying on the ceiling of the inverted operator's compartment. Other company personnel began arriving at the scene to lend assistance but Rogers was non-responsive.

Emergency medical personnel arrived and the victim was pronounced dead at the scene by the Lawrence County coroner. Death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 8:00 a.m. on September 13, 2005, by a telephone call from Doug Ordak to James R. Petrie, district manager. Ordak was the safety director of a nearby Quality Aggregates facility and was contacted by Newgate management to assist at the scene. An investigation was started the same day. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners.

MSHA's accident investigation team traveled to the mine, conducted a physical inspection at the accident scene, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees, the Pennsylvania Department of Environmental Protection, and the Lawrence County Coroner's office.

DISCUSSION

Location of the Accident

The accident occurred at the truck dump site located near the crushing and screening plant. Trucks dumped material from the edge of the permanent dump site to form a stockpile of raw material. The dump site had a gentle arc shape, with more pronounced curvature at the south end. At the location of the accident, the dump site was 21 feet high and 86 feet wide. The surface of the dump site sloped away from the edge at an average grade of 1.5 percent. However, at the accident location, the surface sloped away from the edge at 2.5 percent. A partial berm, between 30 and 32 inches high, existed along the edge of the dump site south of the accident location. However, there was no evidence that a berm existed at the location of the accident. For an overview of the accident scene, please refer to Figure 1.

The dump site was constructed of fill material over top of natural ground to create the elevated work area. The fill material consisted of gravel- and cobble-sized stone with an occasional rock of about 24 inches in a matrix of sandy soil.

The quarry was idle for nine days prior to the accident. During this time, the stockpiled material at the base of the dump site was depleted. Material comprising the dump site was also loaded out which resulted in oversteepening of the slope and the berm being removed in the area of the accident.

Along the edge of the slope, immediately adjacent to where the accident occurred, a small ledge of material still existed. This material projected laterally approximately 2.5 feet out from the edge and had a height of about 6 feet. The slope of this material was oversteepened to about 60 degrees due to loadout operations at the toe of the dump area. Oversteepening of the slope resulted in a lowered resistance to failure (Figure 2).

The oversteepened ledge of material appeared to have continued through the area where the accident occurred. This ledge of material was relatively weak and it failed when the rear tires of the truck backed to this area.

Various cross sections measured at the dump site had overall slope angles ranging from 36 to 48 degrees with the upper portions of the slope generally steeper. The upper portion of the slope above the material dumped by Thompson showed a slope of

60 degrees. The material comprising the dump site had been compacted over time due to truck traffic and contained a significant portion of gravel and sand. The fine fraction of the material appeared to be non-plastic; therefore, the material was classified as cohesionless, meaning that the internal strength of the material was mainly attributed to confinement and friction. However, negative pore water pressures within the fine fraction of the soil created matrix suction forces that gave the soil an apparent cohesive strength. The inclusion of this cohesive strength and confinement from compaction permitted the slopes of the dump site to temporarily maintain an angle greater than the angle of repose.

Slope stability analyses were performed to verify the failure scenario. A frictional strength of 32 degrees was selected based on the gradation of the material comprising the ledge and the compaction history. This scenario showed that an apparent cohesive strength of approximately 300 pounds per square foot (psf) was required to maintain slope stability with a rear wheel loading of 123,280 pounds applied at the crest. This rear wheel loading occurred at the maximum gross vehicle weight of 184,000 pounds. It is unlikely that the material in the ledge possessed the 300 psf of apparent cohesive strength required to maintain stability.

Tension cracks parallel to the crest were observed in the remaining ledge just south of the failure at a distance 2.5 feet back from the edge. The scarp remaining following the failure of the material in the accident area was nearly vertical. A sharp edge existed at the intersection of the scarp and the crown, indicating the failure of the ledge. As the rear of the truck dropped, the downward and lateral momentum caused it to tip and flip over onto the cab. A crease in the slope material was observed where the tail of the bed impacted the slope of the dump.

Equipment

The truck involved in the accident was a 1987 Caterpillar Model 773B, 50-ton haul truck, with a 184,000 pounds maximum gross vehicle weight. It was equipped with a dump bed, a Cat 3412 diesel engine with a flywheel horsepower rating of 650 horsepower at 2,000 revolutions per minute (RPM), and a 7 speed automatic transmission with an electronic shift. According to information provided by Caterpillar, 67 percent of the loaded weight of the truck was carried on the rear axle. When loaded to the maximum weight capacity, the weight on the rear tires was 123,280 pounds.

The hydraulic hoist system of the truck was visually inspected and tested. The hoist cylinder's position was at full retraction, discounting a minor displacement due to frame and dump body twisting. All associated hydraulic lines were visually intact. After the engine was started, the hoist controls were tested and found to be functional.

The transmission selector lever was found in the 1st gear position. The position of the transmission's rotary selector spool (the actual position of the transmission) was found in the reverse position. The transmission selector was cycled through reverse, neutral,

and first gear positions with the engine running. The transmission directionally changed gears when tested and no problems were identified with the shifting of the actual transmission from reverse to neutral or reverse to forward.

The transmission control system also had a neutralizer feature that was operated by a switch on the hoist control linkage. The transmission would automatically neutralize if the hoist lever was moved to raise position and the transmission was in reverse gear. The neutralizer feature functioned when tested because it neutralized the transmission when the hoist control lever was moved to the full raise position. The transmission selector spool was in the reverse position, indicating that the victim hadn't started to dump the load when the truck went over the dump point.

Mud was observed splashed on both of the convex mirrors' surfaces. The off side convex mirror and the driver's side convex mirror would have been difficult to use in this condition; however, the 6 inch by 16 inch (width x height) flat mirror on the driver's side was useable.

A functional SAE J386 seat belt was present in the operator's seating position; however; the victim had not been wearing the seatbelt at the time of the accident.

There were no problems identified with the engine control systems, the braking and steering systems, or the transmission control system that would have restricted the ability of the driver to control the truck at the time of the accident.

Weather

The accident occurred at approximately 6:50 a.m. in daylight. The sky was clear with a temperature of 66 degrees Fahrenheit and no wind. The sun was not a factor in the accident.

Training and Experience

Rogers had 25 years of mining experience and had worked 1 year, 12 weeks at this mine. He had received training in accordance with 30 CFR, Part 46.

ROOT CAUSE ANALYSIS

A root cause analysis was performed and the following causal factors were identified:

Causal Factor: Policies, standards, and controls were inadequate and failed to ensure that berms or similar impeding device were maintained at the dump site.

Corrective Action: Procedures should be established that require berms or similar impeding devices at the dump site to be maintained to prevent overtravel and to ensure that equipment is positioned at a safe distance from the edge of the slope.

Causal Factor: Procedures were not in place to ensure that the dump site was inspected for hazards before a haul truck dumped the first load. Material had been loaded from the stockpile directly below the dump locations which steepened the slope angle and reduced the stability.

Corrective Action: Procedures should be established to ensure that dumping locations are visually inspected prior to dumping the first load on every shift. Frequent inspections during the work shift should be performed for signs of slope instability. The top of the dump area should be examined for cracks, unstable ground, and sunken or soft areas. The load out area should be examined for signs of undercutting and oversteepening of the slope. Employees should be trained to Stop, Look, Analyze, and Manage (SLAM) each task to evaluate hazards and ensure steps are taken to safely perform tasks.

Causal Factor: Procedures were not in place to ensure that the provided seat belts were worn when persons operated mobile equipment.

Corrective Action: Procedures should be established that require management to regularly check equipment operators to ensure seat belts are being worn.

CONCLUSION

The accident occurred because policies, standards, and controls were not in place to ensure that a berm or similar impeding device was maintained at the dump site. The dumping location was not visually inspected to identify signs of possible unstable ground conditions prior to directing trucks to dump. The victim was not wearing a seat belt which contributed to the severity of his injuries.

ENFORCEMENT ACTIONS

Order No. 6034415 was issued on September 13, 2005, at 12:25 p.m., under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on September 13, 2005, when a rock truck driver was dumping over the edge of a 21 foot high primary dump site and the truck overturned. This order is issued to ensure the safety of all persons at this operation and prohibits any work in the affected area until MSHA determines that it is safe to resume normal operations as determined by an Authorized Representative of the Secretary of Labor.

This order was terminated on September 19, 2005. Conditions that contributed to the accident have been corrected and normal mining operations can resume.

Citation No. 6032867 was issued on September 13, 2005, under the provisions of Section 104(d)(1) of the Mine Act for violation of 56.9301:

A truck driver was fatally injured at this operation on September 13, 2005, when a 50-ton haul truck overturned at the dump location located along the top edge of the dump site. A berm was not provided along the elevated edge at this dump site for a distance of 35 feet where a 21 foot drop off hazard existed. The mine operator was aware that material had been loaded out from this stockpile during the previous shift. Failure to ensure that a berm was constructed at this dump location prior to directing miners to dump material at that location constitutes more than ordinary negligence and was an unwarrantable failure to comply with a mandatory safety standard.

This citation was terminated on September 30, 2005. The mine operator has developed a dump site policy and trained all employees in the requirements of the policy. The operator had also installed a berm at the edge of the entire dump site.

Order No. 6032868 was issued on September 16, 2005, under the provisions of Section 104(d)(1) of the Mine Act for violation of 56.9304(a):

A truck driver was fatally injured at this operation on September 13, 2005, when a 50-ton haul truck overturned at the dump location along the top edge of the dump site. The dump site had not been visually inspected prior to loads being dumped on the stockpile that shift. The mine operator knew that material had been loaded out from the base of this stockpile during the previous shift. Failure to visually inspect this dump location to identify signs of possible unstable ground conditions prior to directing trucks to dump constitutes more than ordinary negligence and was an unwarrantable failure to comply with a mandatory safety standard.

This order was terminated on September 30, 2005. The mine operator has developed a written policy on dump site inspections and has trained all persons on the examination requirements and procedures.

Citation No. 6032869 was issued on September 13, 2005, under the provisions of Section 104(a) of the Mine Act for violation of 56.14131(a):

A truck driver was fatally injured at this operation on September 13, 2005, when a 50-ton haul truck overturned at the dump location located along the top edge of the dump site. The truck driver was not wearing the seat belt provided when the truck overturned.

This citation was terminated on September 30, 2005. The mine operator has developed a written seat belt policy and trained all employees in the requirements. This policy includes spot inspections by management and disciplinary actions for employees not wearing seatbelts.

Approved by: _____ Date: _____
James R. Petrie
District Manager

APPENDIX A

Persons Participating in the Investigation

Newgate Development Corporation

Thomas K. Lampert, president
Greig L. McCoy, safety director
John C. Thompson, superintendent

Pennsylvania Department of Environmental Protection

Joseph F. Ferrara, compliance manager
Timothy M. VanDyke, supervisory surface mine conservation inspector
William D. Edmiston, surface mine conservation inspector

Mine Safety and Health Administration

William C. Jensen, mine safety and health inspector
Thomas J. Shilling, mine safety and health inspector
F. Terry Marshall, mechanical engineer
Darren J. Blank, civil engineer
Gary R. Cooper, civil engineer
James A. Young, mine safety and health specialist

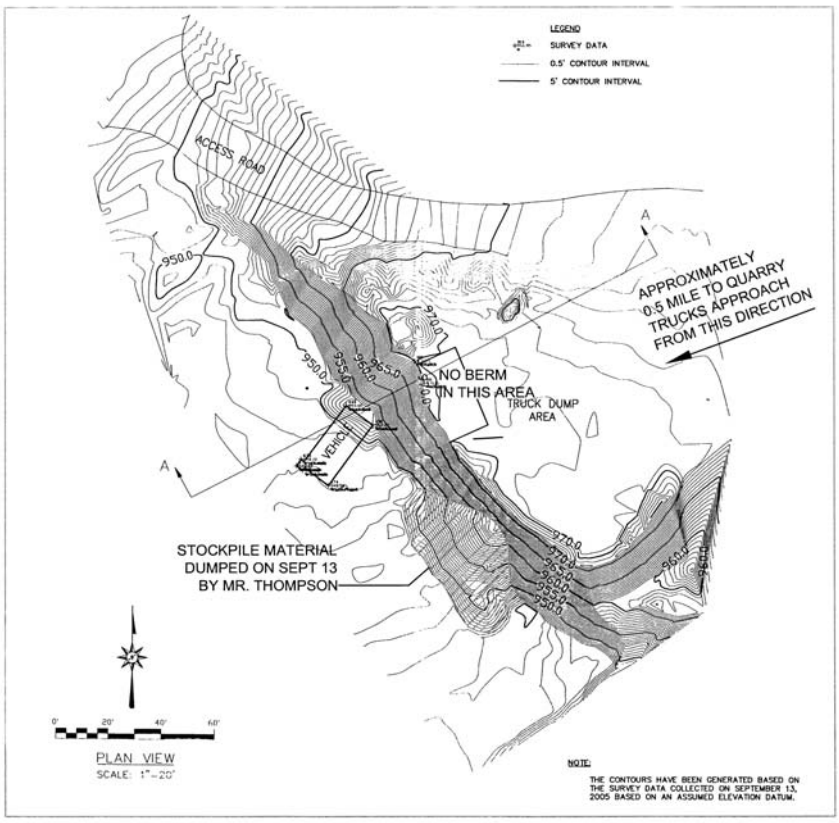

Figure 1 - Overview of Accident Scene

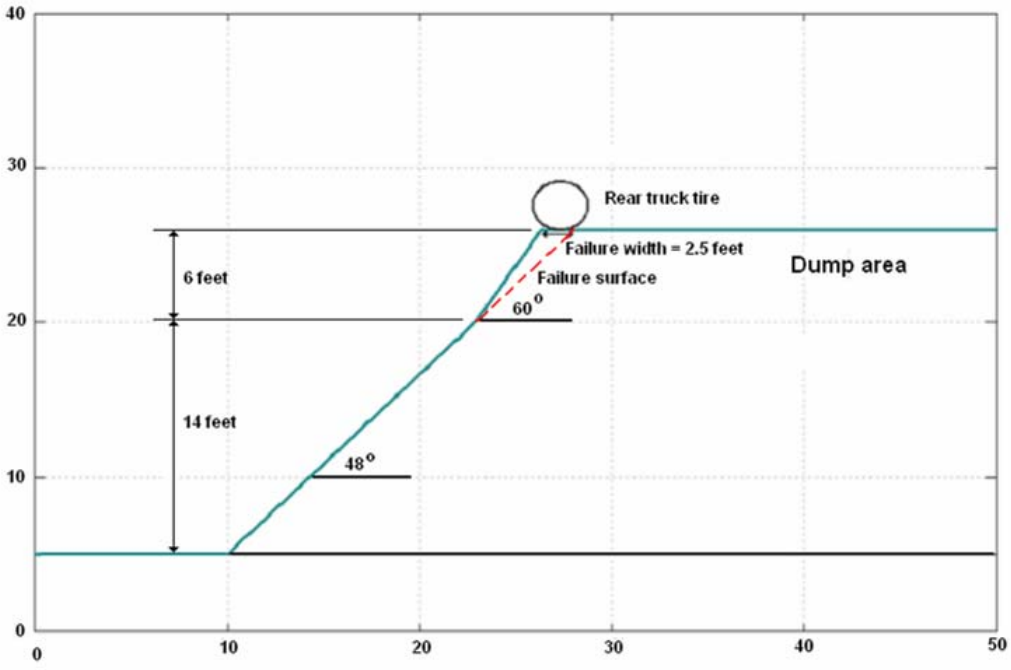

Figure 2 – Cross-section of Accident